Book Reviews

Working memory in second language acquisition and processing

Editors:
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The book *Working Memory in Second Language Acquisition and Processing* edited by Zhisheng (Edward) Wen, Mailce Borges Mota and Arthur McNeill presents a review of theory and empirical research referring to the relationship between working memory (WM) and second language acquisition (SLA). This volume fits in with the cognitive perspective on individual differences research which has been high on the agenda of SLA researchers for the last two decades as one of the most promising and still poorly investigated areas. In the words of Wen, a major proponent of research into the role of WM in SLA, and the other book editors, the enormous value of the volume lies in the fact that it comprises joint efforts of both cognitive psychologists and SLA researchers "to address major theoretical and methodological issues concerning the 'WM-SLA nexus' (Wen, 2012). In so doing, we hope that this current volume can serve as an interactive forum to bridge dialogues from both fields so that WM theories can be further integrated into SLA theories" (p. 2). It has to be emphasized that despite a number

of various studies on this topic, there are still many controversies concerning research methodology, terminology and the general approach, and the results are often inconsistent and contradictory. Although this book does not give ultimate answers to the questions, nor does it provide any definite solutions to the problems, at times even raising more doubt and controversy, it constitutes a significant contribution to the discussion of the role of WM in SLA. Another aspect that makes it so interesting and valuable is the involvement of such big names as Alan Baddeley, Nelson Cowan, Alan Juffs, Randall Engle, Peter Skehan and John Williams, among others, who present the current view of both the theory and research. Therefore, this book is very useful for SLA undergraduate, graduate and postgraduate students, as well as researchers interested in this fascinating and challenging topic.

The volume consists of a foreword, an introduction, four parts: one theoretical and three empirical, and a final commentary. The last chapter in each part is a commentary as well. In the foreword, Michael Bunting and Randall Engle introduce the concept of WM, its functions in human cognition and its impact on first and second language acquisition. Moreover, they present the cognitive psychology perspective on the role of low- and high-level cognitive processes involved in learning a language. Primary sources of individual differences on cognitive tasks, such as WM capacity, declarative knowledge, procedural memory and processing speed are operationalized in order to clarify research terminology, with emphasis placed on WM as the central component of the memory model: "Working memory capacity is thought to be the central factor in this model and is therefore considered to have the greatest influence on an individual's performance on cognitive and learning tasks" (p. xix). What is more, the authors comprehensibly describe the most important models of WM, that is Baddeley and Hitch's (1974) and Cowan's (1995), highlight basic conceptual differences between them as well as provide an overview of both classic and the most up-to-date research endeavors in the field. This section is extremely useful and suitable even for an inexperienced reader as it explains complicated matters in a reader-friendly way with the help of everyday-life examples. The authors finish their review with a conclusion that although there is strong evidence that WM is involved in SLA, it is yet to be answered how it affects this process.

The first part, "Theoretical Perspectives and Models," comprises four chapters which constitute the foundation of the volume. The first two chapters were written by leading cognitive psychologists: Alan Baddeley and Nelson Cowan, respectively. Both researchers present the origins and evolution of their models, as well as a review of research conducted by cognitive psychologists in the field of WM that has investigated the role of its components in various fields

of SLA. Both researchers compare and contrast their models and present possible directions for future research that will elucidate the WM-SLA relationships. Whereas Baddeley, whose model is the most often referred to throughout the book, focuses more on the role of the phonological loop and central executive in various aspects of SLA, Cowan lays more emphasis on the role of the focus of attention in storing and recombining information. Chapter Three, written by the book editor and SLA researcher, Zhisheng (Edward) Wen, in contrast, presents an integrated framework for the WM-SLA nexus. To quote the author, "the third chapter . . . sets out to integrate the rather well-defined and seemingly disparate research paradigms of WM in cognitive psychology into nuanced SLA research" (p. 3). In order to accomplish his goal, Wen presents three unifying characteristics of the WM construct, namely limited capacity, multiplicity of mechanisms and executive functions, and integrity with long-term memory. Then, he presents a review of the most important studies on the role of WM in first and second language acquisition. Based on research findings, Wen relates the phonological component of WM (PWM) and the executive component (EWM) to specific SLA domains and processes. His proposed [P/E] model postulates that PWM underlies acquisitional and developmental aspects of SLA in the domains of lexis, formulaic sequences and morphosyntactic constructions, whereas EWM affects monitoring and attention-related processes, such as comprehension, interaction and production. This chapter is of particular importance to SLA researchers interested in SLA-WM research. The fourth chapter by Yanping Dong and Rendong Cai includes remarks on the theoretical models of WM and the complex relationship between WM and simultaneous interpreting training and performance.

Part 2, "WM in L2 Processing," which explores the relationship between WM and second language processing, includes two empirical chapters and one commentary. In Chapter Five Sun-A Kim, Kiel Christianson, and Jerome Packard investigate the effects of WM on learning to read L2 Chinese characters under two conditions: one employing visual WM and one requiring PWM. The study presents evidence that the better the WM, the better the abilities to read the characters. Besides, different kinds of WM, that is those involving more visual WM versus more verbal WM, contributed differently to reading different kinds of characters. Chapter Six presents a study aimed at an analysis of strategies employed in sentence processing in an L2. Yuncai Dai investigated the processing strategies used by Chinese learners of English and the impact of their WM capacity on resolving the ambiguities of relative clause attachment with the use of a reading span test in two experiments and two offline questionnaires. The researcher concludes that WM plays a substantial role in L2, but not L1 sentence processing. In fact, the results of the study are ambiguous and suggest that the processing of L2 sentences involves a variety of factors interacting

with each other and including both structural information and contextual cues (p. 122). These ambiguities are addressed too by Alan Juffs in Chapter Seven including final remarks. At first, the author refers to the studies which involve the most frequently investigated structures and then comments on inconsistent findings regarding the WM effects in sentence-level processing in an L2. He also presents the results of his own pilot study (Juffs & Rodríguez, 2014) investigating the effect of relative clauses on pronoun-antecedent links in paragraph-length texts, and, consequently, urges for research investigating the role of WM in discourse processing to complement the for-the-most-part inconclusive research into sentence-level processing.

Part 3, "Working Memory in L2 Interaction and Performance," addresses theoretical and empirical issues concentrating on the role of WM in interaction and production. It includes three empirical chapters and one commentary. In Chapter Eight, Shaofeng Li presents the results of a study examining the relationship between one component of foreign language aptitude, that is, analytical ability (see the Modern Language Aptitude Test, MLAT; Carroll & Sapon, 1959/2002) and WM as measured by listening span, and implicit and explicit feedback in two groups of learners: low- versus advanced-level. The conclusion is that WM and analytical ability are sensitive to the proficiency of L2 learners and feedback type, to the effect that low-proficiency learners rely more on analytical ability, whereas advanced ones draw more on WM to benefit from feedback. In Chapter Nine Mohammad Javad Ahmadian provides evidence for a positive correlation between WM capacity, as measured by listening span, and self-repair behavior in an oral narrative task under the online planning condition. Yanbin Lu, in Chapter Ten, reports a study investigating the relationship between WM and L2 written performance. In this case, WM was measured by a nonverbal test—an operation span. No correlation was found between the investigated factors, which led the researcher to conclude that WM does not affect writing performance in L2 argumentative essays. Finally, Peter Skehan comments on the research in speech planning and offers suggestions for further research directions in Chapter Eleven. Skehan presents his view of the role of WM in speech production within the framework of Levelt's (1989) classic speech production model. According to the researcher, a body of empirical evidence confirms that task performance depends on attention capacity limitations, thus conforming to the trade-off hypothesis (Skehan, 2012), "which assumes working memory limitations and then explores how these limitations can be minimized or circumvented" (p. 200), and contradicting Robinson's (2011) cognition hypothesis.

The last part of the book, "Working Memory in L2 Instruction and Development," includes four empirical and one theoretical chapter pertaining to developmental and pedagogical issues in the WM-SLA relationship. This part begins

with three reports of research studies which share one common denominator, namely the lack of the expected relationship between WM and the studied variables. In Chapter Twelve by Kindra Santamaria and Gretchen Sunderman, the effect of WM, as measured by reading span, in processing instruction of L2 French direct object pronouns is investigated. Although no correlation was found between WM capacity and L2 instruction effectiveness, WM differentiated how low- and high-span participants performed on grammar posttests, which led the researchers to conclude that WM is likely to have long-term effects. Interesting and controversial results are presented in Chapter Thirteen by Kaitlyn Tagarelli, Mailce Borges Mota and Patrick Rebuschat, who investigated the relationship between WM and two different learning conditions, incidental and intentional. WM as measured by two nonverbal complex tests did not correlate with a grammaticality judgment test in either condition; however, it correlated with performance in the intentional group. These results indicate that the impact of WM on grammar learning is complex and relevant mainly under explicit conditions. As the authors conclude, "the analyses of individual differences suggest that WMC does affect an individual's ability to learn L2 syntax, but this effect is apparent only in certain conditions and for particular items" (p. 242). A study of the relationship between WM, cognitive complexity and L2 recasts in online language teaching is reported by Melissa Baralt in Chapter Fourteen. Specifically, the researcher intended to test the hypothesis that WM would affect feedback efficacy during task-based computerized chat interaction. As no correlation was found, the author conclude that WM does not affect written feedback efficacy in online language communication. Chapter Fifteen by Anne Mitchell, Scott Jarvis, Michelle O'Malley and Irina Konstantinova, in turn, touches upon one of the most significant problems in the studied domain, that is, the reliability of tools and measurement criteria. The chapter opens with a discussion of how the findings of WM-SLA studies could have been affected by reliance on psychological, instead of SLA, tasks. In conclusion, they suggest that language-independent WM tasks, such as simple digit span or complex operation span, as well as verbal tests in an L1 will be more accurate. To illustrate this claim, they present the results of their own study which makes it evident that WM performance is affected by the proficiency level in the L2. Moreover, the authors suggest that the components of WM affect the learning process differently depending on levels of proficiency. In a similar vein, Clare Wright in Chapter Sixteen discusses the relationship between WM and the longitudinal development in an L2. In particular, she presents studies to confirm or contradict the claim that PWM is relevant for less proficient earlier-stage learners, whilst EWM plays a more important role for more proficient learners. Her conclusion, namely that "it has been seen that the evidence of support for the effects of WM remains

contradictory, largely due to the lack of comparability in methodology in research design" (p. 293), seems to be the best summary of the empirical part of the book.

The book ends with the final commentary by John Williams, who summarizes the theoretical and empirical considerations presented in the volume together with doubts and controversies raised by the studies and perspectives for further research. Evidently, the relationship between SLA and WM is very complex and, although the knowledge obtained from the research is accumulating, there still seem to be more questions than answers. Even if some readers may feel dissatisfaction or even frustration, especially those who expected more uniform results and ultimate answers, this does not in the least affect the unique value of the book. The editors have done an impressive job of gathering the biggest names from the fields of cognitive psychology and SLA to present a comprehensive review of the state of the art in this field, as well as have created a discussion forum on the SLA-WM relationship.

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